

DE-CIX

Annual Report 2017



JOURNEY INTO AN

INTERCONNECTED DIGITAL WORLD



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Harald A. Summa

CEO, DE-CIX Management GmbH &
DE-CIX International GmbH

Message from the CEO

Dear Reader,

The digital world is ever changing and it influences our lives more and more – both privately and in business. We can see the beginnings of this new world today in the transformation of our cities, our factories, and our highways, to name but a few – and this interconnected digital world will profoundly change how we all do business in the future.

Digitalization and the Internet of Things are making interconnecting essential for all industries. The advent of industrial IoT, or Industry 4.0, means that a stable interconnection infrastructure is already essential for doing business, and its significance will only increase in the future. Looking at the ICT industry, we are constantly encountering the spread of new communication technologies, like 5G networks, not to mention established megatrends, such as big data, cloud, and IoT. But there is one thing on this journey you can be sure of: We at DE-CIX can provide you with interconnection excellence and be your close and reliable partner on this path.

It is becoming clear that the ICT markets are changing radically. More competitors are capitalizing on the Internet Exchange business model. Customers now have the choice between quality, service, and economic considerations. DE-CIX is aware of these challenges, with our focus being to accompany these changes by increasing our service portfolio and generating greater value for our customers. Many of these ideas have flowed into our new service world, which offers

our customers a greater flexibility to react to the upcoming challenges and extends the service portfolio with services like DirectCLOUD to better monetize the existing connection to DE-CIX.

No matter which vertical we look into – be it automotive, finance, healthcare, software, or media – we can see the same development occurring. The individual needs of the sectors may require individual solutions, but the basic needs are universal: The ability to interconnect within the sector's ecosystem or across global networks, in order to transport, store, share, manage, and analyze the vastly increasing amounts of data these industries are producing and are dependent on.

This is why DE-CIX is growing from a peering platform to a global interconnection company, offering a new world of interconnection services. Our experience of more than 22 years in the interconnection business – always adapting and expanding our reach across the globe, wherever our customers need us – makes us the outstanding IX operator worldwide.

So join us on a journey into an interconnected digital world, and let us at DE-CIX help you map the future of interconnection.

Harald A. Summa
Chief Executive Officer
DE-CIX Management GmbH & DE-CIX International GmbH



Executive

Summary

Executive Summary

Growth in customers and services

DE-CIX continued its growth course in 2017 and retained its position as the world's leading provider of premium interconnection services. DE-CIX's connected customers have their origins in all major telecommunications markets around the world. In 2017, consolidated global customer growth rose by close to 14 percent. Global connected capacity increased by over 30 percent during the year, with a 50 percent growth in 100 GE ports.

The new DE-CIX Service World was launched in 2017, allowing DE-CIX to respond rapidly to the changing needs of customers in a dynamic global market. Two examples of services offered in the DE-CIX Service World are GlobePEER Remote and DirectCLOUD. The GlobePEER Remote service, initially launched in 2016 between Frankfurt and New York, was progressively expanded in 2017 to include further locations, resulting in accelerating growth for the service and a fourfold increase in take-up during the year. The DirectCLOUD service is now available at seven locations on three continents, enabling customers to access the services of more than thirty certified cloud service providers, including not only large players, but also many niche and specialist cloud providers.

One of the strategically most important undertakings in 2017 was entry into the largely untapped Indian market, one of the markets with the highest business potential for interconnection services on the planet, through a joint venture. DE-CIX also continued to provide consulting services in several locations in 2017, with a focus on Africa, the Middle East, and Asia.

The digital landscape is currently in a state of transition, and DE-CIX services are evolving in order to offer customers simplified interconnection and to increase their potential to monetize their access to DE-CIX platforms, as well as to offset the risk associated with the current market transformation. Furthermore, DE-CIX's new company structure (see Corporate

Governance section), established in late 2017, represents an opportunity for the company to streamline its operations and act more productively and effectively in the global IX market.

Financial results

Despite challenging conditions in the global markets in 2017, the DE-CIX companies recorded satisfying results. Consolidated global turnover increased by 9 percent to €31.8m, and revenue from activities outside of Germany grew by just under 40 percent, accounting for 9.9 percent of turnover. Regular business in Frankfurt contributed considerably to the financial results. DE-CIX finished the financial year 2017 with an EBIT of €0.9m and an EBITDA of €2.75m.

For 2018, turnover is forecast to rise by a further 10 percent to around €35m. Increased revenues are expected from all locations in 2018. An increase in demand is also anticipated for the GlobePEER Remote service, in particular between Frankfurt and New York. Marseille, connected to GlobePEER Remote in 2018, is also expected to experience considerable growth as a result.

Conclusion

To date, DE-CIX has created and is growing thirteen¹ Internet Exchanges on four continents, including Europe, North America, the Middle East, and India. The goal for the coming years is to enable new and existing ecosystems in all major telecommunication markets across the globe. The geographic coverage of DE-CIX, paired with the variety of different interconnection services, will allow connected networks – whether they are acting regionally, in domestic markets, or globally – to get DE-CIX interconnection services customized to their needs from both a geographical perspective and in terms of their respective business models.

¹ The thirteenth DE-CIX Internet Exchange, a strategic partnership with the Berlin based IX BCIX, was added in early 2018.



Organization and

Corporate Governance

Executive Management



Harald A. Summa
Chief Executive Officer
DE-CIX Management
GmbH & DE-CIX
International GmbH



Ivo Ivanov
Chief Strategy
and Corporate
Development Officer,
DE-CIX Management
GmbH / Executive Board,
DE-CIX GmbH & DE-CIX
International GmbH



Felix Höger
Chair of the
Supervisory Board



Klaus Landefeld
Member of the
Supervisory Board



Rudolph van Megen
Member of the
Supervisory Board

Our Structure – the DE-CIX Organization and Corporate Governance

DE-CIX, and all the legal entities which run the DE-CIX Internet Exchanges globally, are owned by eco – Association of the Internet Industry, Europe's largest Internet industry association. eco is a nonprofit organization that promotes the development of the Internet and provides advice and support to companies that do business with or on the Internet. DE-CIX is strictly carrier and data center-neutral. There are two main legal entities managing the DE-CIX business globally: DE-CIX Management GmbH and DE-CIX International GmbH.

The DE-CIX Management GmbH operates the DE-CIX Internet Exchanges in Frankfurt, Hamburg, Munich, Dusseldorf, and the UAE-IX in Dubai as Managed Services in cooperation with datamena. The company is led by CEO Harald Summa, founding member of eco e. V., and is guided in its decision-making by the Customer Advisory Board. The Board is elected by DE-CIX customers, and meets twice a year to oversee management, develop strategy, and ensure the secure and stable growth of the company.

At the end of 2017, the legal form of DE-CIX International AG, overseen by the Supervisory Board, was changed into a GmbH (limited liability), led by the CEOs Harald A. Summa and Ivo Ivanov. DE-CIX International GmbH is responsible for the vast majority of the international activities of the DE-CIX brand, either directly (Madrid, Marseille, and Palermo), or through subsidiaries in the USA (New York and Dallas) and Turkey (Istanbul). Furthermore, the Angola-based Agonix has placed its trust in the consultancy services of the company. In 2017, DE-CIX International also entered into a joint venture to establish the DE-CIX Interwire India PLC, to operate the Mumbai IX, as a first entry-point of DE-CIX into the promising Indian market.

In autumn 2017, the DE-CIX Group AG was established, with the objective of consolidating in the future the business of the DE-CIX companies and financial investments under one organization.

DE-CIX Management GmbH Senior Management



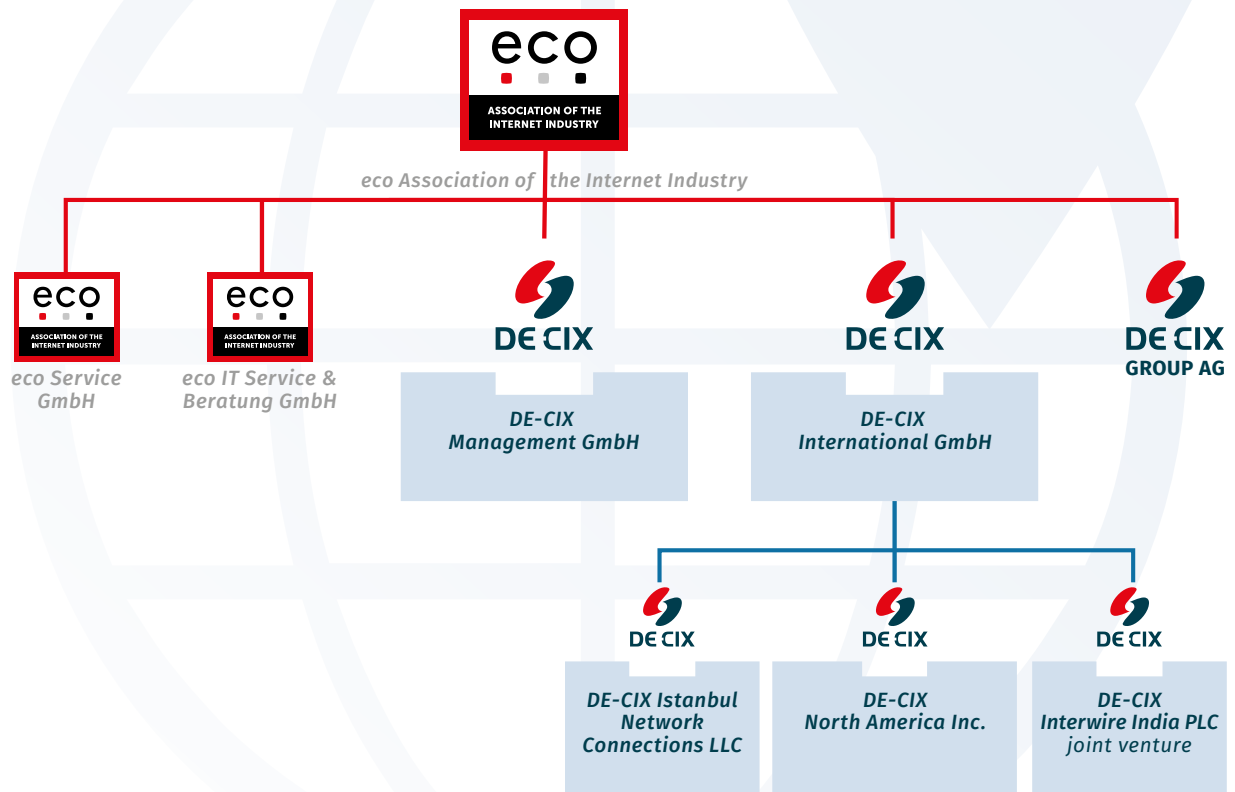
Lucia Falkenberg
Chief People Officer



Thomas King
Chief Innovation Officer



Daniel Melzer
Chief Technology Officer



Arnold Nipper
Chief Technology
Evangelist and
Co-Founder of DE-CIX



Gregor Reinhold
Chief Financial Officer



Stephan Rohloff
Chief Marketing Officer



Andreas Sturm
Chief Business
Development Officer

The Customer Advisory Board



Falk von Bornstaedt
Head of Group Peering
and IP-Trading
Deutsche Telekom AG



Zaid Ali Khan
Senior Director Global
Infrastructure
Architecture and
Strategy, LinkedIn



Bernhard Krönung
Managing Director and
Founder
regio [.NET]



Klaus Landefeld
Board Member
eco – Association of the
Internet Industry e. V.



Joshua Sahala
Interconnection
Strategist
Microsoft

Our customers' opinion counts – the DE-CIX Customer Advisory Boards

The Customer Advisory Boards reflect the customer base, as their members can be seen as representatives of the variety of networks connected to DE-CIX: national and international, small and large ISPs, as well as global content providers. While the Customer Advisory Boards do not have decision-making authority, their members communicate with the DE-CIX management team and help guide the overall direction of DE-CIX.

DE-CIX Management GmbH Customer Advisory Board

The board has five members in order to represent the global customer reach of DE-CIX. One of the board members is appointed directly by eco – Association of the Internet Industry. The other four members are elected directly by DE-CIX customers. A new Customer Advisory Board for the DE-CIX Management GmbH was elected in 2017 and announced during the DE-CIX Summit in Frankfurt.

DE-CIX North America Customer Advisory Board

The four members of the DE-CIX North America Customer Advisory Board were appointed by DE-CIX North America Inc. in 2016.

DE-CIX North America Customer Advisory Board



Phil Koblenz
COO
New York Internet – NYI



Steven Schecter
Senior Manager of Network
Architecture
Akamai Technologies Inc.



Bryan Socha
Senior Network Engineer
DigitalOcean



Carl Williams
Network Engineer
Linode



Lucia Falkenberg
Chief People Officer

Human Resources

Our staff are the essence of success – dedicated, experienced, and multicultural

At DE-CIX – the world's leading Internet Exchange operator – more than 100 employees from 20 nations ensure the smooth data exchange of more than 1300 network operators, Internet Service Providers and content providers from more than 100 countries every day. However, DE-CIX is more than just a technical platform; we see ourselves as a team of local and global networkers bringing together technologies, the Internet industry, and people around the world. In the interest of our customers, we develop forward-looking interconnection services that promote their business – in a way that is secure, long-term, and reliable.

As such, DE-CIX is constantly looking for new talent, experienced engineers, and developers to join the DE-CIX family. Among many benefits, we offer flexible office hours, home office, regular trainings, a company pension scheme, attractive sports programs, weekly English lessons, and German lessons for our international

colleagues. Added to this, DE-CIX offers our staff an increasingly varied health care program, and a range of extra benefits. A relaxed and collegial atmosphere is encouraged. As well as building an internationally diverse team, the HR department is also intent on developing more of a gender balance, and is actively seeking female specialists to join the team.

More information about DE-CIX and our job offerings can be found at our career website under www.de-cix.net, or by contacting our Chief People Officer Lucia Falkenberg directly (lucia.falkenberg@de-cix.net)



About Research & Development at DE-CIX

At DE-CIX, we not only take care of the smooth and trouble-free operations of our global Internet Exchanges, but are also investing in the future of how the Internet will be shaped. Therefore, the DE-CIX Research & Development team, almost fully subsidized through publicly funded research projects, monitors and analyzes the rapid innovation in the entire digital environment, enabled by a smoothly operating Internet infrastructure, and applies its learning to shape the technical future of the Internet ecosystem.

The DE-CIX Research & Development team considers new technological trends such as SDN, NFV, 5G, cloud, Big Data, and the Internet of Things and their impact on the interconnection landscape. On the one hand, the insights gained are essential for future DE-CIX products, services, and/or the network infrastructure and, on the other hand, they empower DE-CIX decision-makers. In 2017, the DE-CIX Research & Development team supported new and enhanced DE-CIX services, contributed to international standardization, and published at academic conferences.

In 2017, the research outcome for the DE-CIX Research & Development team was outstanding, with publications at prestigious conferences such as ACM SIGCOMM, ACM Internet Measurement Conference (IMC), and the ACM Symposium on SDN Research (SOSR). Topics such as “Detecting Peering Infrastructure Outages in the Wild” and “Inferring BGP Blackholing Activity in the Internet” drew considerable audience attention. Moreover, the publicly funded research projects BDPsec and X-Check continued to deliver results, including providing practical value for DE-CIX operations.

The ENDEAVOUR project, focusing on SDN-enabled IXPs, came to a very successful conclusion in December 2017, with a running prototype. A summary of the findings appeared in the IEEE Journal on Selected Areas in Communications (JSAC), “ENDEAVOUR: A Scalable SDN Architecture for Real-World IXPs”. The most relevant outcomes of the DE-CIX Research & Development team were shared at global community conferences such as RIPE, NANOG, and EURO-IX.

In addition, the DE-CIX Research & Development team devoted a substantial amount of time in 2017 to developing projects to launch new products or advanced services in the near future, and to continuing standardization efforts within the IETF community. The objective is to absorb demands for technical harmonization of the industry and thus ease operations for IXP customers and operators, now and in the future.

“Bringing the DE-CIX Point of Presence live at the 1025Connect facility has been one of our most anticipated projects. When it comes to access to submarine capacity, affordable and robust terrestrial connectivity, direct to cloud interconnection and more, the DE-CIX platform is a critical gateway.”

Hunter Newby, Partner, 1025Connect



Look into

the Future



Christoph Dietzel

Head of Research &
Development, DE-CIX

A Look into the Future: How the Internet Will and Must Change

As the leading operator of Internet Exchanges in the world, we see it not only as our task to assess current trends in digitalization and to incorporate these into our business models, but rather, and more importantly, to look into the future; far into the future – at least, from a digital perspective. So we look, for example, at questions like what the structure of the Internet will be in ten to fifteen years, which standards will shape the Internet, and how this will play out for society, our customers, and in particular for DE-CIX's technological strategy. A journey that has long since begun, and which we, of course, wish to play a role in forming and shaping.

The present: Everything must be connected

The vision statements of Fortune500 companies generally convey emotions, are colorful and loud. But increasingly, they all also want to be digital. Everything needs to be interconnected, and Artificial Intelligence is set to revolutionize our daily lives. Innovation in core competencies is no longer sufficient: In the automotive industry, connected and autonomous multimedia-cars will take us from A to B. Nothing will work in the future without the Internet and a far-reaching understanding of IT. Particularly for the Internet, the largest system developed by humanity, the multitude of new use cases means shorter and shorter development cycles and increasing innovation.

From the user perspective, the Internet works relatively well; sure, here and there it could do with being a bit faster, but end users will not even notice the changes that will be required in the coming years. Enabling Internet infrastructure to supply self-driving cars with 4K videos via 5G and to turn on the lights and heaters shortly before we get home demands continuous structural and technological changes. With such complexity and strong growth, it is difficult to maintain an overview of the developments.

Slow standardization processes run contrary to the pace of change

The Internet can be understood as one large network made up of around 65,000 independent sub-networks. These sub-networks are operated by diverse companies, such as Deutsche Telekom, Google, and Facebook. So that the communication between them works seamlessly, it is essential to standardize the protocols for data transfer. The majority of standardization processes occur in the Internet Engineering Task Force (IETF). Consensus is sought in standards – this encourages quality, but it also slows the standardization process and runs contrary to the fast pace required.

Technological changes have the objective of improving particular areas/aspects of the Internet. That could be, for example, new transmission technologies like 5G, which increase users' bandwidth and transmission speed in access networks.

Other concepts are more visionary in nature. The Internet of Things supports the interconnection of more and more machines without human interaction. New concepts for data processing, data transmission, and security must be devised and implemented. Of course, new technologies and solutions in this area continue to demand standardized protocols, which at times can turn into a protracted process. The change-over of IP addresses to a new format (IPv6) has already taken a decade and is still not finished. This example illustrates how complex it is to adapt important Internet protocols to new requirements.

A present trend is the introduction of freely programmable network equipment, in contrast to the current generation in which the only thing that occurs is the configuration of a standardized protocol. This enables sub-networks in the mid-term to develop their own protocols and to deploy these within closed domains.

Hypothesis: The Internet will become less centralized

New technologies and paradigms also lead to structural changes in the Internet infrastructure. Faster and more efficient networks allow higher data rates and thus new fields of application which, for their part, make new demands. The introduction of cloud computing led to an upheaval in the strictly hierarchical and distributed Internet. Today, it is considerably more strongly centralized and interconnected. Providing sufficiently high-performance support for new fields of application – for example, Virtual Reality or Cloud Gaming – will require a more decentralized way of thinking in the future.

For large companies from all sectors, but also for small and medium-sized enterprises, Internet usage will be inverted. Only a few years ago, the main reason for connecting to the Internet was to communicate with others. In the future, the Internet will be used more and more to offer new services. Companies want to get in direct contact with customers. What will be decisive will be to position oneself in the market – in the right place at the right time – and to build up an understanding of the development of the Internet.

“Joining DE-CIX was a life changer. We found that 70% of our incoming traffic was coming through our DE-CIX link, thus saving paid transit link resources. Our average latency to the main content providers decreased by 50%. The relationship with DE-CIX has been smooth in every aspect. Their business model is very flexible and attractive, while the implementation and support teams are extremely professional and effective.”

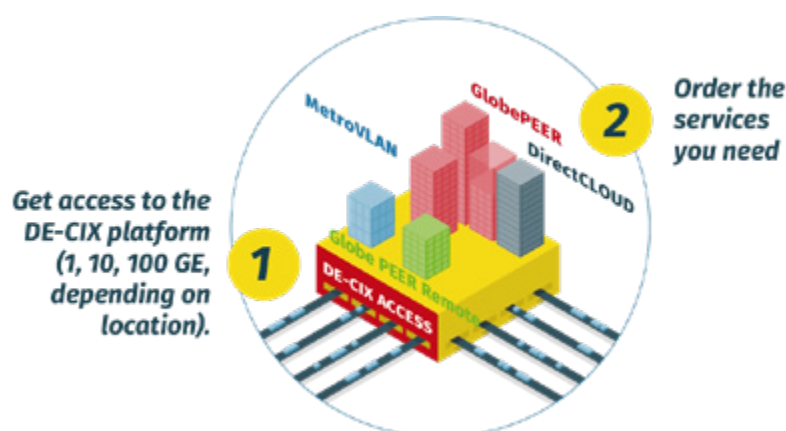
Miguel Berniz, CTO, GibFibreSpeed





The New

DE-CIX Service World



The New DE-CIX Service World

Monetizing your business by making the most out of your access to us

As the world of interconnection is ever changing and evolving, we at DE-CIX want to help our customers to make the most out of their business with us. Therefore, we launched the new DE-CIX Service World in 2017, which simplifies interconnection for our customers – now and in the future.

With access to the DE-CIX platform, customers can book multiple services and also have multiple ASNs connected using one single physical connection. Depending on location, access to the DE-CIX platform is possible with 1GE, 10GE, or 100GE, and it can be booked independently from services.

Customers can overbook their access with services and can add new services as they become available on the platform.

This allows DE-CIX to respond rapidly to the changing needs of customers in a dynamic market, making it possible for them to increase the service portfolio they offer to their end customers, as well as generate new revenues with the DE-CIX Service World.

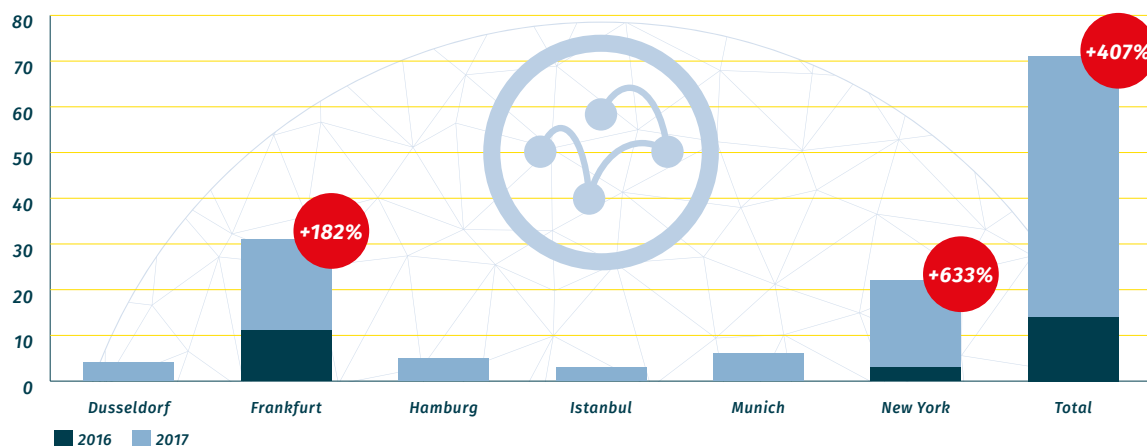
Services currently available through the new DE-CIX Service World:

GlobePEER

DE-CIX customers can continue to peer in the traditional manner on the most advanced Layer2 switching platforms in the industry. The GlobePEER service enables networks to peer with hundreds of networks almost instantly via the DE-CIX route servers. The need to negotiate bilateral peering agreements is significantly lower. This service is available at all DE-CIX Internet Exchanges worldwide. In order to connect more than one ASN, additional GlobePEER services can be used.



DE-CIX GlobePEER Remote Port Growth 2017



GlobePEER Remote

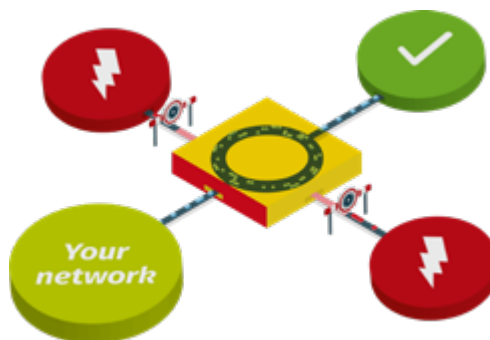
At selected locations, customers can use their DE-CIX access to peer at additional DE-CIX locations. The DE-CIX platforms in Frankfurt, Hamburg, Munich, Dusseldorf, New York, and Istanbul are interconnected for this purpose. With access in one of these locations, customers can peer remotely at each of the other locations using the GlobePEER Remote service.

Launched initially in 2016 between Frankfurt and New York, the GlobePEER Remote service was then progressively expanded to include further locations, resulting in accelerating growth for the service and a fourfold increase on the 2016 levels.



Blackholing

To help our customers mitigate the effects of Distributed Denial of Service (DDoS) attacks against their networks, we offer customer-triggered Blackholing. This service is available at all DE-CIX locations except Dubai and Mumbai, and is free of charge for DE-CIX customers.



DirectCLOUD

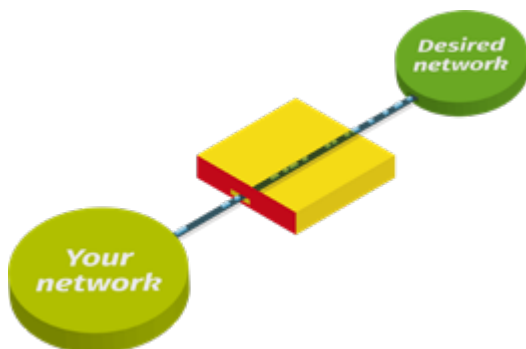
Many companies are currently facing the challenges of digital transformation. In this context, DirectCLOUD enables ISPs to offer their customers exactly what companies are missing to enable hybrid cloud usage: performance, security, and reliability.

Thirty certified cloud service providers now offer their services through the DE-CIX platforms at selected locations, including not only the large players like Microsoft, Amazon, and Google, but also many niche and specialist providers in areas ranging from DDoS prevention through to Software as a Service.

DE-CIX supports ISPs and data centers to connect their customers, and participating cloud partners to drive forward digital transformation, by helping to raise awareness of the complex topic in the market through the provision of use cases, sales training, and marketing support.

MetroVLAN

DE-CIX offers networks the possibility to peer privately or connect directly to a network at a different DE-CIX location, by just using a VLAN. Multiple VLANs to single destination ports (E-Line) or to multiple destination ports (E-LAN) are possible. The E-Line is a virtual point-to-point private line which allows customers to install one or multiple VLANs on an access and connect to other customers, regardless of which DE-CIX-enabled site they have connected to.



Booking an E-line for interconnection within a metro region is possible at all DE-CIX locations except Istanbul, Dubai, and Mumbai. Customers can also connect via VLAN to any other DE-CIX-enabled site, using the MetroVLAN Remote service: This service is available at the DE-CIX locations in Frankfurt, Hamburg, Munich, Dusseldorf, New York, and Istanbul.

"It is amazing how peering with DE-CIX has improved our service, greatly minimizing the latency, and how our traffic increased by a factor of 10 as soon as we established new peering relationships."

Luis Sánchez, Manager, WiFi Sancti Petri

Benefits for



DE-CIX Customers

Benefits of Being a DE-CIX Customer

At DE-CIX, our customers are always at the center of our activities. Unlike other IX operators, our job does not end at the access to our Internet Exchanges across the planet. Every day, we are looking for new ways that our customers can make the most out of their business with us – by supporting, helping to monetize their business with us, and developing new services for them. Over the decades, thousands of customers from almost every country around the globe have relied on DE-CIX. Even so, the journey into the future of an interconnected digital world has really only just begun.

Whenever you need us – The DE-CIX 24/7 Customer Service

Making customers' lives easy: DE-CIX is a reliable partner that invests heavily to assist and support its customers in all aspects of their business. The DE-CIX 24/7 Customer Service is renowned for providing the best support a customer can wish for. DE-CIX offers a single point of contact for all kinds of questions around provisioning, troubleshooting, and also consulting. But the service goes even further: If a customer is experiencing problems within their own networks, the DE-CIX Customer Service team is more than happy to assist in troubleshooting issues that are within the customer's own network, or even between them and their provider. With more than two decades of experience, DE-CIX can provide a lot of knowledge-based documentation and best practices for customers, helping them to make the best out of their connection to DE-CIX.

A series of successes: DE-CIX wins Best Internet Exchange award for third year in a row

In 2017, DE-CIX was again recognized as the Best Internet Exchange worldwide during the Annual Global Carrier Awards ceremony. DE-CIX has now earned this important industry award for the third consecutive year.

The annual Global Carrier Awards recognize innovation, vision, and excellence across the global and regional data center and Internet Exchange market. A panel of



telecoms analysts, industry experts, and the senior editorial team of Capacity magazine judge the awards.

Experience – interact – network: The DE-CIX events

At DE-CIX, meeting and interacting with our customers personally is one of the essentials of our business. In 2017, DE-CIX conducted a series of events to share the latest technical and market trends, share our company news, and listen to our customers' opinions. One of the highlights was the DE-CIX Tech Meeting held in Frankfurt in June. 100+ interconnection professionals met in the DE-CIX headquarters to be brought up to speed on the most recent insights into research and development on the future of the Internet, as well as getting important updates on the latest security developments in interconnection ecosystems. The Tech Meeting will also be an essential event in the DE-CIX 2018 event plan.

Under the motto "Journey into an interconnected digital world", DE-CIX took a one-day conference module on the road to Frankfurt, Madrid, Istanbul, and New York, and presented the newest trends and future scenarios of a digital interconnected world. The lineup of internationally renowned speakers included former Amazon mastermind Dr. Andreas Weigend, who demonstrated to the audience the influence of Big Data on our lives – both from a private and business perspective – and the enormous influence of data in the modern world.

On top of this, DE-CIX is always there where the industry meets. We actively support global community events



such as PTC, ITW, NANOG, ENOG, RIPE AfPIF, Capacity events, and many more. Meet our experts wherever the industry comes together.

Well informed with our DE-CIX Academy

The DE-CIX Academy is the central knowledge provider. Wolfgang Tremmel – with more than 20 years of industry experience – heads up the DE-CIX Academy, which offers free-of-charge web-based trainings twice a week in German and English, focusing on technical, network, and peering related topics. The academy has also released a set of “Knowledge Cards” – useful reference guides, each summarizing one technical topic, along with a range of white papers.

In 2017, the DE-CIX Academy provided more than 50 webinars with over 500 participants. One of the future focus topics in 2018 will be webinars about BGP (Border Gateway Protocol) – especially for network engineers – and also in-person offline trainings for DE-CIX customers.

Always on the spot – DE-CIX Consultancy Services

With over two decades of experience in the interconnection business, DE-CIX is also a trusted partner when establishing new global digital hubs and ecosystems around the globe. With the DE-CIX professional Consultancy Services, customers can rest assured that they have the right partner on board to expand their business. DE-CIX Consultancy Services target telecom operators, ISPs, corporate entities, government agencies, and regulatory authorities around the globe. DE-CIX Consultancy Services support the establishment of Internet Exchanges in developing regions; to enable local peering in these regions and to



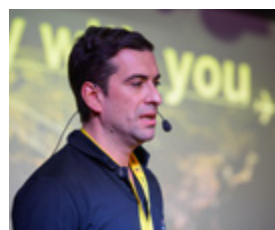
further strengthen the global Internet. DE-CIX provided consulting in several locations in 2017, with a focus on Africa, the Middle East, and Asia.

DE-CIX Consultancy Services provide customers with the relevant set of both strategic and operational insights to allow a decision on the best approach for



the establishment and management of an IXP and the creation of a vibrant ecosystem, with its focus including the following objectives:

- Consulting on mechanisms for developing healthy interconnection ecosystems in a variety of regions;
- Assessing the readiness of the dedicated region for an IXP, taking into consideration (benchmarking) the market and the regulatory / legal framework and further IXP developments in the region, providing a gap analysis, SWOT, and risk analysis;
- Providing an Implementation Plan with an appropriate time-line for the establishment of an IXP, consisting of a CAPEX/OPEX outlook based on the recommendations, amended by technical and organizational information;
- Providing a Go-To-Market Plan, consisting of a revenue plan, amended by a business development and marketing plan;
- Integrating and operating the IXP in line with the Go-to-Market Plan.



DE-CIX 2017 in Numbers

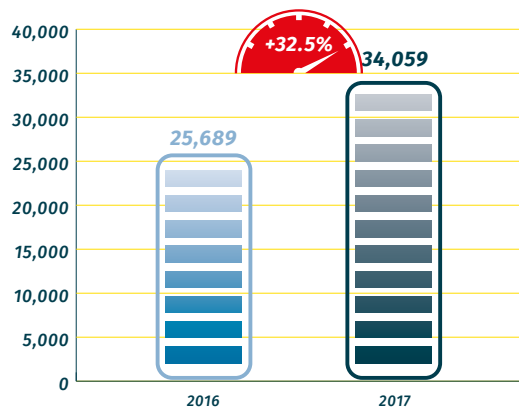


Global Growth

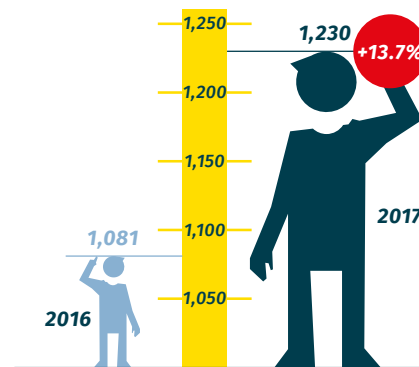
DE-CIX 2017 in Numbers – Global Growth

The DE-CIX exchanges around the globe continued their unabated growth in 2017. Global connected capacity increased by over 30 percent during the year. One clear trend was the growth in 100 GE ports, which saw an increase of close to 50 percent. Consolidated global customer growth rose by close to 14 percent in 2017, spurred onwards by the services made available through the new DE-CIX Service World. DE-CIX's connected customers have their origins in all major telecommunications markets around the world.

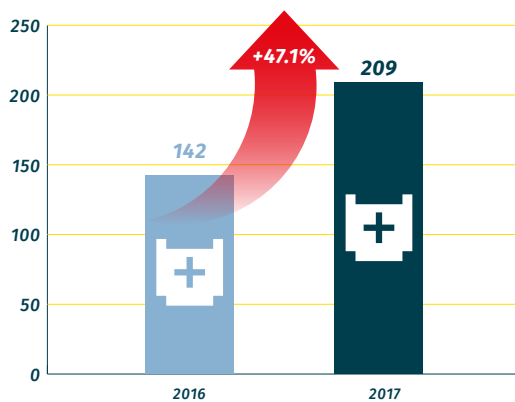
DE-CIX Global Connected Capacity Growth 2017 (Gbit)



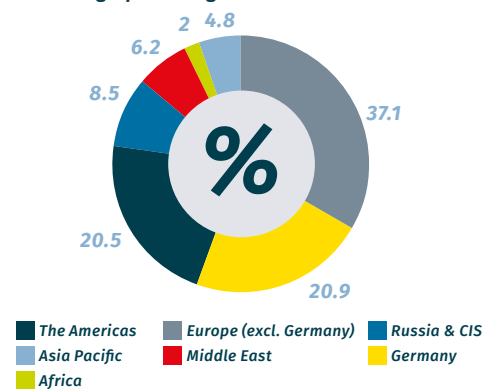
DE-CIX Global Customer Growth 2017



DE-CIX Global 100GE Ports Growth 2017



DE-CIX Global: Geographical Segmentation of Networks



Note: Segmentation based on data from PeeringDB

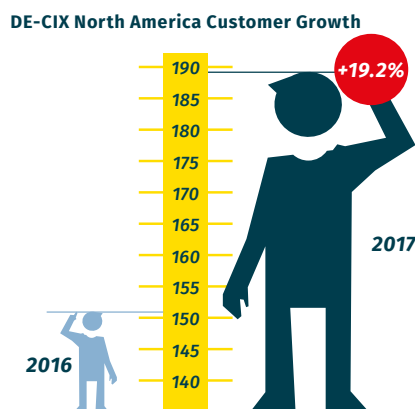
Regional Growth from West to East



Ed d'Agostino
Vice President, North America

North America

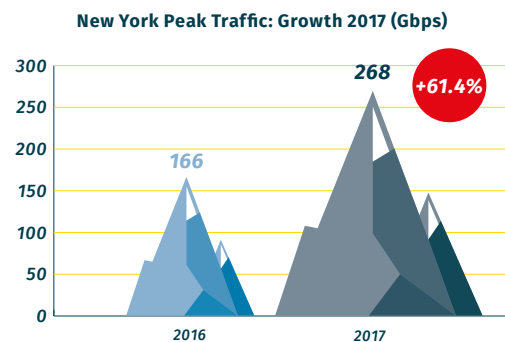
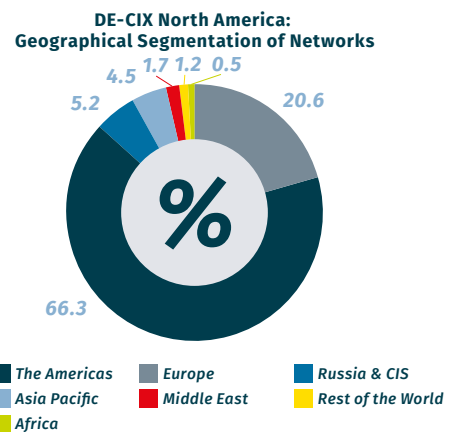
DE-CIX North America, the fastest growing carrier and data center-neutral U.S. Internet Exchange operator, offers an Internet Exchange platform across major carrier hotels and data centers throughout the New York and New Jersey metro markets, and operates the only open and data center-neutral Internet Exchange in the Dallas-Fort Worth market. Both DE-CIX New York and DE-CIX Dallas are Open-IX certified by the OPEN-IX Association (OIX), a nonprofit, neutral body of volunteers from the Internet created to improve the landscape of Internet peering and interconnection throughout the world. Both exchanges became 100 GE-ready and connected their first 100 GE ports in 2017. The region experienced considerable customer growth during the year.



Highlights from DE-CIX New York

Less than four years from commencement of operations, DE-CIX New York is ranked as the second largest IX in the New York / New Jersey / Long Island metro region, a market with an uncharacteristically high volume of

IX operators. DE-CIX New York experienced a strong growth in connected capacity during 2017, increasing by 72 percent to 2.5 Terabits. This led to an associated increase in traffic over the platform, with peak traffic rising by over 60 percent to nearly 270 Gbps. Strong growth in customers and ASNs (with more than 150 networks signed by the end of 2017) led to a 25 percent increase in 10GE ports connected at DE-CIX New York.



Highlights from DE-CIX Dallas

In little more than a year, DE-CIX Dallas has developed strong traction, becoming a competitive force ranking second in the Dallas market. The first 100GE ports were connected, and connected capacity tripled in relation to 2016 levels. Customer numbers and ASNs rose strongly throughout the year, finishing the year with almost 40 networks signed.



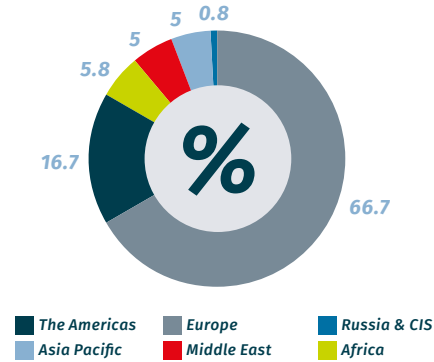
Theresa Bobis
Regional Director South Europe

Southern Europe

Worldwide, IP traffic will triple by 2021, and Africa, the Middle East, and Asia Pacific have the strongest traffic growth rates. Traditional traffic flows are changing, heading towards Southern Europe, especially the Iberian Peninsula and the Mediterranean coast, due to its strategic position and an ever-increasing number of submarine cables landing there.

With its three Internet Exchanges in Madrid, Marseille, and Palermo, DE-CIX drives forward the booming interconnection ecosystem by growing the digital gateways for traffic coming from and going to Africa, Asia, and the Americas. In 2017, the southern European exchanges all experienced strong growth, with at least a doubling in 10 GE ports and connected capacity.

**DE-CIX Southern Europe:
Geographical Segmentation of Networks**

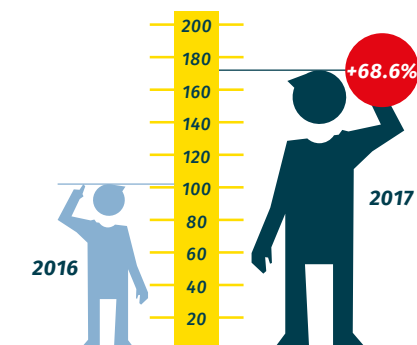


Note: Segmentation based on data from PeeringDB

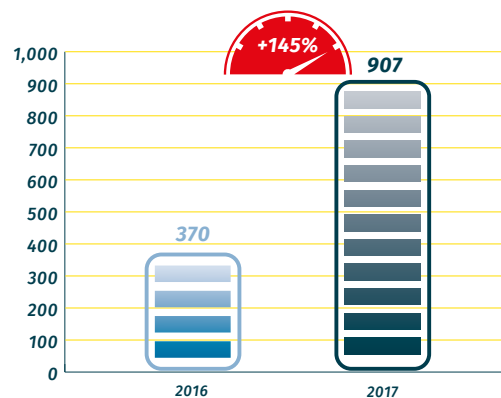
Highlights from DE-CIX Madrid

During 2017, DE-CIX Madrid became the fastest growing IX globally. The platform connected over 100 networks by the end of 2017, and the data traffic broke records on a week-to-week basis. Customer numbers grew by almost 60 percent during the year. In August 2017, DE-CIX Madrid announced its agreement with Itconic (now Equinix), one of the main providers of IT infrastructure in the country, allowing customers to access DE-CIX services through the Itconic data center platform, made up of five centers located in Madrid (x2), Barcelona, Seville, and Lisbon. DE-CIX Madrid became 100 GE-ready in 2017, and the first 100 GE ports were connected. Connected capacity nearly tripled during the year.

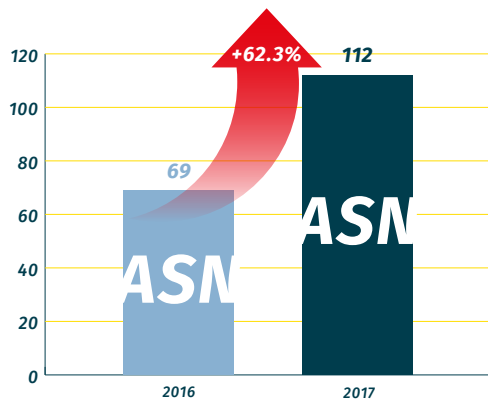
DE-CIX Southern Europe Customer Growth 2017



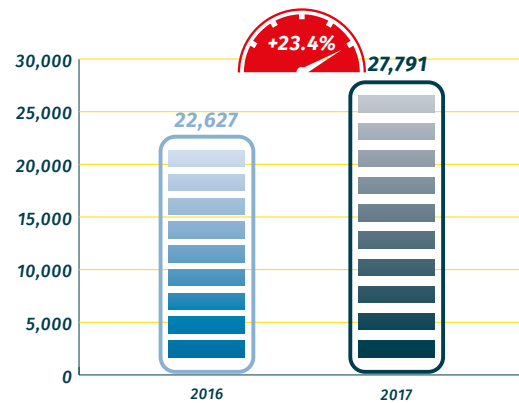
DE-CIX Madrid Connected Capacity Growth 2017 (Gbit/s)



DE-CIX Madrid ASN Growth 2017



DE-CIX Frankfurt Connected Capacity Growth 2017 (Gbit)



Andreas Sturm
Chief Business Development
Officer

Germany

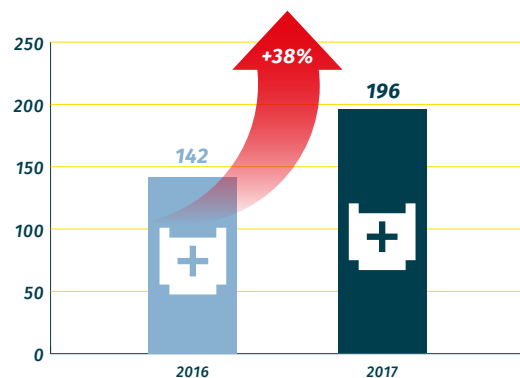
In our home market of Germany, DE-CIX operates four Internet Exchanges – in Hamburg, Dusseldorf, Frankfurt, and Munich. Frankfurt is Europe's digital capital, and with more than 6 Terabits per second peak traffic, DE-CIX Frankfurt is the world's leading Internet Exchange. Right in the heart of Europe, you can reach more German and Eastern European networks than at any other Internet Exchange in the world.

Highlights from DE-CIX Frankfurt

DE-CIX Frankfurt retained and strengthened its global position as the flagship Internet Exchange in the DE-CIX family and the largest IX in the world in terms of data throughput. The world record was broken twice in 2017 reaching an all-time high at over 6 Terabits per second in early December.

Overall in 2017, the 38 percent growth in 100 GE ports and the resulting 23 percent increase in connected capacity – bringing the exchange up to a staggering connected capacity of 27.79 Tbit – is a story that speaks for itself. The already large customer base experienced further growth of 7 percent during the year, bringing the total number of ASNs to nearly 800 for this exchange alone.

DE-CIX Frankfurt 100GE Port Growth 2017

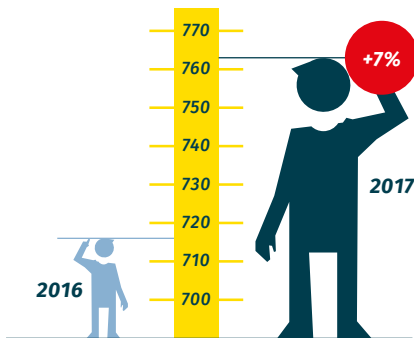


German Regional Exchanges

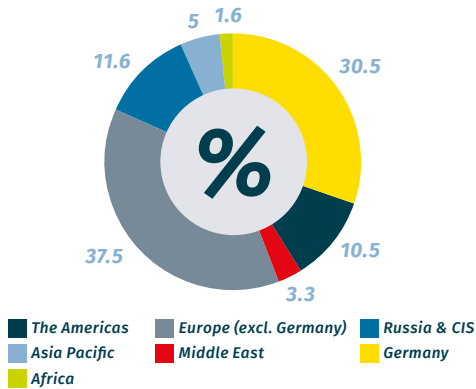
The smaller German regional DE-CIX Internet Exchanges in Hamburg, Munich, and Dusseldorf also experienced growth in 2017 – especially the youngest exchange, DE-CIX Dusseldorf – as a direct result of the newly implemented GlobePEER Remote service. This service allows networks in the regional locations to peer directly at the Frankfurt hub, an offer which is being increasingly

taken up by customers. The first 100 GE ports were connected at DE-CIX Hamburg in 2017, and connected capacity grew strongly in both Hamburg and Dusseldorf. The three exchanges experienced consolidated growth of nearly 20 percent during the year.

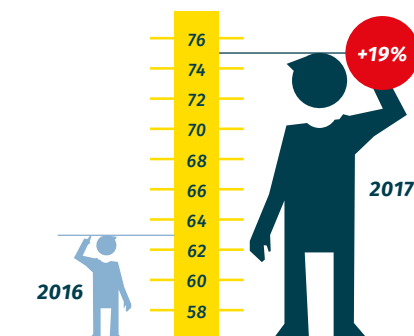
DE-CIX Frankfurt Customer Growth 2017



DE-CIX Frankfurt: Geographical Segmentation of Networks



DE-CIX German Regional Exchanges Customer Growth (excluding Frankfurt)



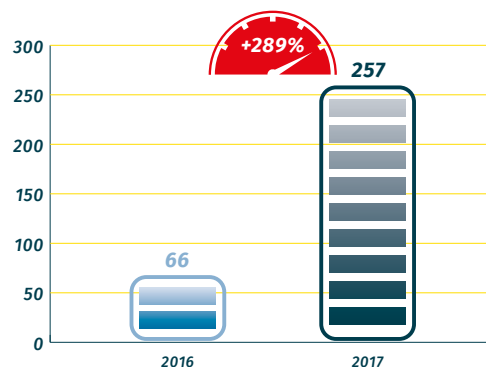
Bülent Şen
Regional Director Turkey

DE-CIX Istanbul

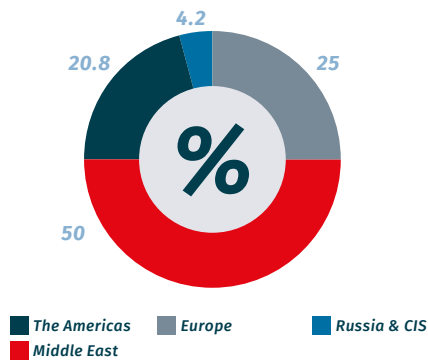
DE-CIX Istanbul is a neutral interconnection and peering point for networks from Turkey, Iran, the Caucasus region, and the Middle East. The exchange gives access to a variety of networks via various data centers across Turkey, including Istanbul, Ankara, Bursa and İzmir. The IX took a new Point of Presence (PoP) at the Zenium Istanbul One data center in Turkey into operation in 2017.

DE-CIX Istanbul experienced strong growth throughout 2017, with a tripling of 10 GE ports, and an associated almost quadrupling of connected capacity. Customer numbers increased by 38 percent during the year. Peak traffic shot up from around 6 Gbps early in the year to around 45 Gbps in December 2017.

DE-CIX Istanbul Connected Capacity Growth (Gbit)

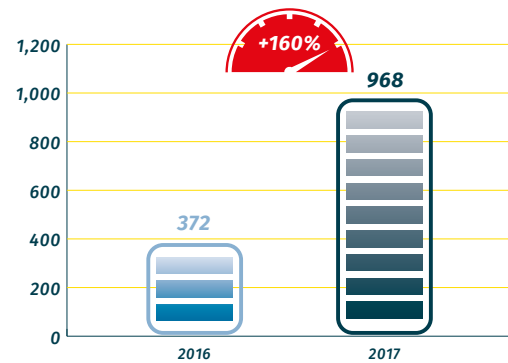


**DE-CIX Istanbul:
Geographical Segmentation of Networks**



Note: Segmentation based on data from PeeringDB

UAE-IX Connected Capacity Growth (Gbit)



At the end of 2017, UAE-IX was upgraded to the powerful DE-CIX Apollon technology platform and made 100 GE-ready. The Internet Exchange enjoyed 19 percent growth in customers in 2017, and ended the year having almost tripled the number of 10GE ports connected. Peak traffic grew steadily throughout the year, from a high of 65 Gbps in 2016 to over 80 Gbps in 2017.

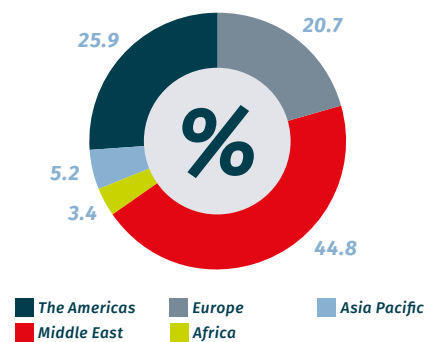


Marco Brandstaetter
Business Development Manager

UAE-IX powered by DE-CIX (Dubai)

UAE-IX powered by DE-CIX is a carrier and data center-neutral Internet Exchange for the Middle East that interconnects global networks and, above all, network operators and content providers in the GCC region. Initiated by Emirates Integrated Telecommunications Company (EITC) with the support of the UAE's Telecommunications Regulatory Authority (TRA), it dramatically improves IP network resilience, routing efficiency, and the quality of the Internet experience for end-users.

**UAE-IX:
Geographical Segmentation of Networks**



Note: Segmentation based on data from PeeringDB



Frank Orlowski
Senior Vice President Corporate
Development

Mumbai IX

After signing a Memorandum of Understanding (MoU) earlier in 2017, in October, DE-CIX announced the establishment of a joint venture to serve the Indian market. The partnership brings together DE-CIX and “Interwire”, a local technology group that operates the Mumbai Internet Exchange “Mumbai IX”. The newly founded DE-CIX Interwire India plc is operating under the “Mumbai IX powered by DE-CIX” brand. With this joint venture, DE-CIX added its 12th Internet Exchange (IX) globally.

With close to 100 connected customer networks by the end of 2017, Mumbai IX has already developed into the leading provider on the Indian subcontinent.

“DE-CIX boosts our growth strategy to drive connectivity across all businesses within the technology-concentrated business areas within the Dallas/Fort Worth Metroplex and beyond.”

Raul Martynek, CEO of DataBank

Technical

Infrastructure

Technical Infrastructure – At the Forefront of Technology

The cutting-edge platform DE-CIX Apollon provides world-class reliability and availability in a scalable design which can grow with the needs of DE-CIX's customers.

DE-CIX Apollon setup in Frankfurt

The platform in Frankfurt utilizes ADVA Optical Networking's FSP 3000 for the optical backbone, in addition to Nokia's 7950 XRS. The optical backbone has a total capacity of 48 Tbps across a mesh-network topology and provides transport capacity of up to 8 Tbps per fiber. The DE-CIX core layer consists of four of Nokia's 7950 XRS and supports a world-leading port density of up to 320 100 Gigabit Ethernet ports. Current plans see the core capacity being scaled up to 128 Tbps by 2020.

DE-CIX Apollon Infrastructure Frankfurt is built from four supernodes, each of which comprises of a combination of an ADVA optical node, a Nokia edge router, and a Nokia core router. DE-CIX Apollon delivers a very high level of redundancy: All four cores are in operation all the time. Should one fail, there is still sufficient capacity to switch all the traffic in every case.

New milestone: DE-CIX 12 in Frankfurt

A range of activities were undertaken around the world to enhance DE-CIX services in 2017, including the migration of the largest site in Frankfurt (DE-CIX FRA 7) to a new data center in Equinix (DE-CIX FRA 12). Aside from the Apollon migration in 2013, this was the biggest migration in the history of DE-CIX. The planning started in 2016, and the cross-functional project team built the new site in 2017. In 2018, around 30% of all fiber connections in Frankfurt will be migrated, in order to move all customer services to the brand new DE-CIX FRA 12. DE-CIX FRA 12 is also based on the newest Nokia technology, which allows even higher capacity with the FP4 network chip generation on the 7950 XRS20e.

In the course of setting up DE-CIX Frankfurt 12, the team improved our provisioning software toolchain. This now makes it possible to detect physical changes on the customer-facing interfaces and to migrate customers in a software-supported way. Until 2017, the software automation was triggered manually by Customer Service. By being able to react automatically to physical changes, it is now possible to migrate customers with lower impact on their connectivity.

400 GE ready

100 GE ports, which DE-CIX began offering in 2013, are now in the mass market. The major new trend in the near future will be 400 GE ports, which will take over from the 100 GE over the next 4 to 5 years. During 2017, DE-CIX 12 became the first edge to be upgraded with the trailblazing, next-generation capacity of 48 Tbps, making it 400 GE-ready. We can expect to see the first sales of 400 GE ports in 2019. DE-CIX Frankfurt is always at the forefront when it comes to the use of new technology, and the upgrade to 400 GE ports will be no exception.

International development and location growth

On the international front, UAE-IX in Dubai was upgraded to the Apollon infrastructure in 2017. The software team developed software automatization for the server infrastructure provisioning. In North America, the backbone in New York was upgraded from 10 – 100 GE using Infinera technology, and a further location became operational in Dallas (DFW5). In addition, several sites received a hardware upgrade to a larger chassis to support the growth of the customer base worldwide – as occurred in DE-CIX MAD1, DE-CIX NYC3, DE-CIX HAM1, and many more sites.

In addition to this, Hamburg and Munich were connected via the GLOBEPEER Remote service to the Frankfurt platform in early 2017, and capacities were expanded in all locations during the year.



Financial

The graphic features a central blue sphere with a white grid pattern. Overlaid on the sphere is a red line graph showing an upward trend. The graph is set against a background of a blue sky with a bright sun or light source on the right, creating a lens flare effect. The wings and tail of an airplane are visible in the lower right corner, suggesting a global or aviation context. The word 'Financial' is written in a bold, yellow, sans-serif font on a blue rectangular banner that wraps around the top of the sphere.

Report

Financial Report

2017 results

This financial report is provided in consolidated form for the second year in a row. Consolidated global turnover of the DE-CIX family of companies increased by a healthy 9 percent in 2017 to €31.8 m. Activities outside of Germany accounted for 9.9 percent of earnings, representing a proportional increase of just under 40 percent in comparison to 2016.

2017 saw growth in revenues for both existing and new revenue sources. In terms of existing revenue sources, DE-CIX New York experienced 66 percent growth as compared to 2016. Madrid, as the fastest growing Internet Exchange in the world, also experienced enormous growth.

Regular business in Frankfurt contributed substantially to the financial results. In Frankfurt, the GlobePEER service also showed considerable increase, with customer upgrades to multiple 100 GE ports.

DE-CIX's new service structure began to pay off through revenues from the DirectCLOUD and GlobePEER Remote services. Additional revenues were earned through the upgrade of UAE-IX to the tried and tested Apollon platform, which enabled an increase in performance in Dubai to the level offered to customers in Frankfurt.

2017 represented a further investment period for growing the global presence. In a number of the new locations, revenues were limited as a result of ramp-up phases to bring new customers to the IXs. Added to this, DE-CIX made considerable investments into making all remaining locations 100 GE ready, undertaking backbone expansion in New York, and doing upgrades in data centers – for example, a bigger cage at Digital Realty in New York, and a new data center in Frankfurt (DE-CIX 12). The DE-CIX Apollon platform is now in service at all DE-CIX Internet Exchanges, except Mumbai and BCIX¹.

Operating expenditure rose as a result of the increase in growth, as the rising customer demand in an expanding number of international locations impacted power and maintenance costs.

The rise in personnel costs is a result of the segmentation and reinforcement of business development (sales) in international regions, in order to provide our customers with the best possible customer care through highly qualified staff.

Other operating costs include, above all, an increase in marketing and travel costs, as a result of the expansion in personnel mentioned above, and their participation in international events.

DE-CIX finished the financial year 2017 with a very healthy equity ratio of 74 percent. The EBIT was €0.9 m and the EBITDA €2.75 m.

¹ The thirteenth DE-CIX Internet Exchange, a strategic partnership with the Berlin based IX BCIX, was added in early 2018.

Outlook 2018

For the reporting year, the forecast growth of €1m was more than doubled, with growth in turnover exceeding €2.5m. The forecast for 2018 is roughly €35m in turnover, representing growth of approximately 10 percent. The proportion of turnover from activities outside of Germany will continue to increase.

There continues to be significant growth potential in Frankfurt, with a constant increase in new ASNs, both direct and through resellers. New submarine cables which are to land in the Mediterranean (in Lisbon and Bilbao) will bring increased traffic from West Africa and South America, representing great growth potential for South Europe.

Furthermore, the DE-CIX exchanges in Marseille, Palermo, Dallas, and Istanbul will contribute more strongly to financial results in 2018, after the conclusion of the respective ramp-up phases. Increased revenues are expected from all locations in 2018. An increase in demand is also anticipated for the GlobePEER Remote service, in particular between Frankfurt and New York. To be ready for this, an upgrade of capacity is to be undertaken in 2018. Marseille, to be connected to GlobePEER Remote in 2018, is also expected to experience considerable growth as a result.

Further potential for customers has been established in Dubai as a result of the upgrade of the UAE-IX infrastructure to the renowned DE-CIX Apollon platform.

Investments in infrastructure upgrades will continue at the same level as in 2017.

Risk analysis

In a period in which customer companies are undergoing continuous consolidation, DE-CIX currently finds itself confronted with the risk that, as a consequence of acquisitions within the market, there could be a reduction in customer numbers.

We take account of the risk resulting from price sensitivity not only by generating new revenue channels through new services, such as DirectCLOUD connections between global cloud providers, ISPs, and enterprises, but also by optimizing our cost structures.

There will be continued currency risk in 2018 due to the strength of the Euro, which will be more than compensated for by the increased revenues from new services and existing DE-CIX operations across the globe.

DE-CIX's new company structure, established in late 2017 (see Corporate Governance section), represents an opportunity for the company to streamline its operations and act more productively and effectively in the global IX market.

Balance Sheet 2017

Assets	2017	2016	Liabilities and Equity	2017	2016
Assets	EUR	EUR	Equity	EUR	EUR
1. Intangible Assets	1,539,627	442,213	1. Authorized Capital	1,100,000	1,050,000
2. PP&E	3,248,757	2,459,101	2. Reserve Capital	3,501,895	2,501,895
3. Investments	468,006	28,712	3. Additional paid-in capital	5,000	5,000
			4. Profit carried forward	6,466,745	6,671,938
			5. Profit	42,382	1,004,240
Current Assets	4,875,661	3,938,047	Provisions	394,458	531,675
Cash	4,306,024	6,656,649	Liabilities		
			1. Trade accounts payable	2,198,338	1,663,532
			2. Other current liabilities	1,229,256	638,218
Other receivables and pre-paid expenses	561,581	585,276	Other payables and deferred income	61,582	43,500
Total	14,999,656	14,109,998	Total	14,999,656	14,109,998

Profit and Loss Account 2017

	2017	2016
	EUR	EUR
Turnover	31,862,171	29,345,737
Other Revenues	798,638	1,339,363
Personnel Costs	7,222,143	5,799,517
Depreciation	1,829,054	1,724,629
Other Operating Costs	22,691,454	21,212,337
Interest Earned	3,132	25,959
Interest Paid	229,464	17,300
Net Operating Income	691,826	1,957,276
Tax	649,444	953,036
Profit	42,382	1,004,240



Strategic

Outlook



Ivo Ivanov

Chief Strategy and Corporate Development Officer, DE-CIX GmbH / Executive Board, DE-CIX Management GmbH & DE-CIX International GmbH

Strategic Outlook – Journey into an Interconnected Digital World

Digital is reshaping how business is done

We are at the cusp of a completely new age in global economics, with organizations redefining their activities and their sectors on the basis of digitalization. Digital transformation is not a single step, but a continual process, encompassing more and more aspects of business processes and business models. Even organizations that are already digital will become increasingly more digital over time, and need a new interconnection service regime for the services they will be rolling out over the next few years. New and transformative technologies such as the Internet of Things (IoT), Artificial Intelligence (AI) and 5G are accelerating the pace of change in markets around the globe.

Digital is redefining products and transforming business models

Long-established digital companies are changing their business models and entering into new industry sectors. The classic network operator as the historical core customer of DE-CIX is no longer just a network operator. Tech companies are entering different sectors and the variety of different products is increasing. We no longer have the clear delineation of network operators that we had even five years ago.

But it's not only the digital companies that are undergoing transformation. Old industry is redefining itself and its products in the digital era. If we take the automotive industry as an example, they no longer talk about the technical specifications, they talk about intelligent systems. The car company of the future will not sell just wheels, it will sell digital services and applications. The car is being transformed into a digital platform for different services.

Another example of sectors undergoing change is banking and financial services. Digital companies as diverse as the hardware manufacturers Apple and Samsung as well as telecommunications companies have moved into the areas of payment solutions and/or online banking. Organizations are leveraging their digital strength to reshape their own business models, in turn transforming how business is done within and across entire sectors.

Digital markets demand high-performance, flexible, and customized interconnection

For this reason, DE-CIX platforms and ecosystems need to be able to cater for a variety of different services. The interconnection regime in the future will require flexibility in terms of different interconnection models and will need to cater for different types of interconnection needs, such as peering, cloud connectivity, security services, private federations with specific SLAs and security policies, and many more.

DE-CIX: Cultivating digital ecosystems to serve customers' diverse needs in connectivity market places across the globe

DE-CIX has created extremely successful and well-established interconnection ecosystems. We are using these ecosystems to introduce new services following the path of our customers' needs – anywhere where we find good conditions for successful growth. At the heart of the DE-CIX strategy is our goal to make interconnection easy. This means a continued promotion of the direct, cost-efficient and resource-efficient use of interconnection.

DE-CIX around the world – geographically placed where our customers need us to be

To date, we have created and are growing thirteen¹ Internet Exchanges on four continents, including Europe, North America, the Middle East, and India. Our goal for the coming years is to enable new and existing ecosystems in all major telecommunication markets across the globe. The geographic coverage of DE-CIX, paired with the variety of different interconnection services, will allow connected networks – whether they are acting regionally, in domestic markets, or globally – to get DE-CIX interconnection services customized to their needs from both a geographical perspective and in terms of their respective business models.

Classic network operators as we know them today are historically the core for DE-CIX and remain key to DE-CIX's activities. However, we see a need for new interconnection services for enterprises coupled with cloud connectivity and with global interconnection needs.

We invite everybody who is digital today, or who is on the road to digitalization, to think about new ways of using our interconnection services. The DE-CIX ecosystems as a whole, and the participants within these ecosystems, create the ideas together with us to map the journey into an interconnected digital world.

¹ The thirteenth DE-CIX IX, BCIX, was added in early 2018



New York ●

Dallas ●

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networks
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